

1 Attorney Docket No. 82839

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3 AN ASSEMBLY OF UNDERWATER BODIES AND LAUNCHER THEREFOR

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used  
7 by or for the Government of the United States of America for  
8 Governmental purposes without the payment of any royalties  
9 thereon or therefor.

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11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 The invention relates to the launch of bodies from  
14 submarines at various depths, and is directed more particularly  
15 to the launch of bodies, such as weapons, vehicles, and the like,  
16 from locations outside the pressure hulls of submarines.

17 (2) Description of the Prior Art

18 The United States Navy has expressed a need to carry greater  
19 payloads of weapons/vehicles on submarines and a need to launch  
20 weapons/vehicles from modular, external, payload bays.  
21 Traditionally, such bodies have been stowed inside submarine  
22 torpedo rooms, protected from the pressure and corrosiveness of  
23 the ocean environment, and then launched from the submarine  
24 torpedo tubes when needed.

1       Accordingly, there is a need for an assembly for underwater  
2       bodies, including an appropriate launcher therefor, which  
3       assembly is adapted to be mounted outside a submarine pressure  
4       hull, and is operable to separate the underwater bodies from the  
5       launcher by force of gravity.

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#### SUMMARY OF THE INVENTION

8       An object of the invention is, therefore, to provide a  
9       launch assembly mounted outside the pressure hull of a submarine,  
10      for housing and releasing bodies underwater, and underwater  
11      bodies for exiting the launch assembly and dropping downwardly by  
12      force of gravity until well clear of the submarine, and  
13      thereafter navigating under its own power.

14      With the above and other objects in view, a feature of the  
15      present invention is the provision of an assembly of underwater  
16      bodies and a launcher therefor. The assembly is adapted for  
17      mounting on a submarine outside the pressure hull. The assembly  
18      includes a launcher comprising a housing for enclosing an  
19      underwater body, a body support structure within the housing for  
20      supporting the body, a pressure regulator system in communication  
21      with the housing for imposing a selected pressure on an interior  
22      of the housing, a hatch pivotally mounted on the housing, and an  
23      actuator for opening the hatch to permit the body to exit the  
24      hatch, and for closing the hatch. The assembly further includes  
25      an underwater body comprising a self-propelled body adapted to

1 exit by gravity from the launcher. A release device is disposed  
2 on at least one of the launcher and the body for releasing the  
3 body from the launcher to permit the exit of the body from the  
4 launcher by gravity.

5 The above and other features of the invention, including  
6 various novel details of construction and combinations of parts,  
7 will now be more particularly described with reference to the  
8 accompanying drawings and pointed out in the claims. It will be  
9 understood that the particular assembly embodying the invention  
10 is shown by way of illustration only and not as a limitation of  
11 the invention. The principles and features of this invention may  
12 be employed in various and numerous embodiments without departing  
13 from the scope of the invention.

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#### 15 BRIEF DESCRIPTION OF THE DRAWINGS

16 Reference is made to the accompanying drawings in which is  
17 shown an illustrative embodiment of the invention, from which its  
18 novel features and advantages will be apparent, wherein  
19 corresponding reference characters indicate corresponding parts  
20 throughout the several views of the drawings and wherein:

21 FIG. 1 is a diagrammatic perspective view of one form of an  
22 assembly of underwater bodies and a launcher therefor,  
23 illustrative of an embodiment of the invention;

24 FIG. 2 is a widthwise sectional view of the assembly of FIG.

25 1;

1           FIG. 3 is a perspective view of one underwater body released  
2   from the launcher of FIGS. 1 and 2; and

3           FIG. 4 is a perspective view of the underwater body of FIG.  
4   3, after having activated its self-propelling means.

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6                   DESCRIPTION OF THE PREFERRED EMBODIMENTS

7           Referring to FIGS. 1 and 2, it will be seen that the  
8   illustrative assembly includes a launcher 10 for retaining and  
9   selectively releasing one or more underwater bodies 12.

10          The launcher 10 preferably is a cylindrically-shaped housing  
11   14 closed at an upper end 16 and open at a lower end 18. A hatch  
12   20 is provided at the lower end 18 and is operable to close the  
13   housing lower end 18.

14          Disposed within the housing 14 is a support framework 22  
15   configured to provide support for the one or more bodies 12.  
16   Preferably, the framework 22 is of a substantially rigid  
17   construction covered with an elastomeric material. Similarly,  
18   the housing 14 is of a substantially rigid material with the  
19   interior surface covered with an elastomeric material. The  
20   framework 22 loosely holds the underwater bodies 12 inside the  
21   housing 14. The elastomeric material cushions the bodies 12  
22   against shock loads and aggressive submarine maneuvers. The  
23   framework 22 and underwater bodies occupy most of the housing  
24   interior volume. Optionally, the assembly may include rigid

1 sleeves 23 mounted in the framework 22 and in which the bodies 12  
2 are slidably retained.

3 The housing 14 and closed hatch 20 provide a water tight  
4 container which protects the bodies 12 from corrosive seawater  
5 and from high sea pressures. The container is adapted to  
6 withstand sea pressure at the deepest operating depths of the  
7 submarine on which it is mounted. The container normally is  
8 maintained at atmospheric pressure with gas, such as air.

9 Pressurization of the container is effected by a gas or  
10 water pressurization system 24, which typically comprises a high-  
11 pressure air flask system which may include the submarine main  
12 ballast tanks, or a gas generator. Prior to a launch, the  
13 pressurization system 24 operates to increase the pressure in the  
14 container to substantially equal the outside water pressure. A  
15 seal is positioned around lower end 18 of housing 14. By  
16 maintaining a slight negative pressure in the container with  
17 respect to the environmental pressure, sealing of the hatch 20  
18 against the housing 14 will be maintained.

19 The hatch 20 is operated by an actuator 26 which, upon  
20 equalization of pressure inside and outside the container, causes  
21 the hatch 20 to open. Inasmuch as the inside and outside  
22 pressures are substantially equal, opening of the hatch 20 is not  
23 undertaken against relatively heavy outside pressure. In a  
24 preferred embodiment, actuator 26 is a hydraulic actuator that is  
25 connected to the submarine's hydraulic system. Control of

1 actuator 26 is provided by the hydraulic system. A sensor can be  
2 positioned on actuator 26 to indicate the position of actuator 26  
3 and hatch 20. Other types of actuators such as pneumatic or  
4 electrical actuators can also be used for this purpose.

5 Inasmuch as the housing 14 is opened at the lower end 18,  
6 the pressurized air is confined to the housing, keeping the  
7 bodies 12 therein dry and free from contact with seawater.

8 The housing 14 is provided with a release device 28 which  
9 locks the bodies 12 in the housing, and releases a selected body  
10 upon receiving a release signal from inside the submarine.

11 Each of the underwater bodies 12 may be provided with a  
12 weight 30 which is releasably attached to the body and jettisoned  
13 after launch (FIG. 3). If the body 12 is sufficiently heavy to  
14 descend from the housing 14 the weight 30 may be omitted.

15 In an alternative embodiment, each of the bodies 12 is  
16 provided with an individual release mechanism 32 and held  
17 thereby, rather than by the release mechanism 28 referred to  
18 above.

19 In operation and in preparation for a launch, the submarine  
20 maneuvers into a position sufficiently distant from the ocean  
21 bottom to allow a body 12 to drop from the submarine. Using the  
22 gas pressurization system 24, the interior of the housing is  
23 pressurized so as to have internal pressure substantially equal  
24 to external sea pressure. Inasmuch as the bodies 12 and support  
25 framework 22 occupy most of the volume of the housing, relatively

1 little pressurized air is required, at least with a fully loaded  
2 housing. Upon equalization of pressure, the hatch actuator 26  
3 opens the hatch 20. A "firing" signal from the submarine serves  
4 to unlock the release mechanism in use, 28 or 32, which permits a  
5 body 12 to slide out of the framework 22 and into the sea  
6 therebelow, clear of the housing 14.

7       Upon clearing the housing 14, the weight 30, if used, is  
8 jettisoned and a self-propelling means is started, whereupon the  
9 launched body 12 starts its travel (FIG. 4), in accordance with a  
10 guidance system, to carry out a mission.

11       The hatch actuator 26 closes the hatch 20 and the gas  
12 pressurization system 24 then draws air from the housing 14 until  
13 the pressure in the housing returns to atmospheric. The  
14 withdrawn air may be exhausted or, preferably, is returned to the  
15 submarine pressurized air system.

16       There is thus provided a reliable and inexpensive assembly  
17 of weapons and launcher therefor, which assembly is located  
18 outside the pressure hull of the submarine. Use of the assembly  
19 herein described in lieu of the usual torpedo room arrangement  
20 eliminates the need for torpedo tubes, impulse tanks, shutter  
21 doors, inlet cylinders, missile doors, breech doors, and weapon  
22 handling and loading systems. Further, by locating the  
23 underwater bodies external to the submarine pressure hull, the  
24 weight of the bodies is greatly reduced, in view of the buoyant  
25 force difference between air and water. This difference allows

1 for a smaller and less costly submarine volume to float the  
2 weight of the underwater bodies.

3       It will be understood that many additional changes in the  
4 details, materials, steps and arrangement of parts, which have  
5 been herein described and illustrated in order to explain the  
6 nature of the invention, may be made by those skilled in the art  
7 within the principles and scope of the invention as expressed in  
8 the appended claims.